## REMARKS

In view of the preceding amendments and the comments which follow, and pursuant to 37 C.F.R. § 1.111, amendment and reconsideration of the Official Action of October 21, 2003 is respectfully requested by Applicant.

### Summary

Claims 1 – 16 stand rejected. Claims 1 – 16 remain pending following entry of the present amendments and remarks.

### Rejection under 35 U.S.C. § 103

The Examiner has rejected claims 1, 2, 7, and 13 - 16 under 35 U.S.C. § 103 (a) as being unpatentable over US Patent Publication 2002/0034055 to Seyama et al in view of Mack et al. (US 6,462,919) and in further view of Torng et al. (US 6,447,689). The pending claim 1 relates to a magnetic sensing element which comprises a laminate. The laminate includes a first antiferromagnetic layer, a pinned magnetic layer, a nonmagnetic conductive layer, a free magnetic layer, a nonmagnetic interlayer, a ferromagnetic layer, and a second antiferromagnetic layer, which magnetically couples with the ferromagnetic layer to orient a magnetization of the ferromagnetic layer in a predetermined direction. Further, claim 1 recites that "the laminate has a recess extending through the second antiferromagnetic layer and the ferromagnetic layer, a bottom face of the recess lying in the nonmagnetic interlayer, a width of the bottom face in a track width direction being equal to a track width."

Thus, as claimed the nonmagnetic interlayer is only partly removed to have the bottom face of the laminate recess be located in the nonmagnetic interlayer, which is, as stated above, sequentially layered on top of the free layer. Whereas, in Mack the bottom face of a recess lies directly on the top of free layers 208 and 232, see Figures 6A and 6B respectively. The structure of the laminate provides the nonmagnetic interlayer 16 to function as a protective

layer for the free magnetic layer 15 in the region corresponding to the track width Tw. In addition, by forming a nonmagnetic interlayer 16 using a conductive material, the nonmagnetic interlayer 16 can further function as back layer exhibiting a spin filter effect (See page 51, line 27 to page 52, line 5). Typically, a giant magnetoresistance (GMR) effect is mainly caused by a "spin-dependent scattering" of electrons. That is, the GMR effect is obtained using the difference between the mean free path $\lambda^+$ of the conduction electrons having a spin parallel to the magnetization direction of a magnetic material, i.e., a free magnetic layer (for example, spin-up electrons) and the mean free path $\lambda^-$ of the conduction electrons having a spin antiparallel to the magnetization direction (for example, spin-down electrons).

Further, when a back layer is provided, the spin-up electrons which have passed through a free magnetic layer are transported through the back layer by an additional mean free path determined by the material of the back layer, and then are scattered. That is, by providing the back layer, the mean free path of the spin-up electrons is extended by the additional mean free path length (See page 54, line 21 to page 55, line 1). As such, since the nonmagnetic interlayer 16, shown in Fig. 1, functions as a back layer, the mean free path of spin-up conduction electrons can be extended. Therefore, a change in the mean free path of spin-up electrons due to an applied external magnetic field is increased, thus improving the rate of the change in resistance ($\Delta R/R$) in the spin-valve magnetic sensing element (See page 55, lines 2 – 7). Hence, the magnetic sensing element has improved sensitivity to magnetic fields, such as magnetic fields related to stored data.

Therefore, the additional sensitivity of the magnetic sensing element due to the laminate recess having a bottom face in the nonmagnetic layer is not disclosed or suggested by Seyama, Mack or Torng. As such, Claim 1 is therefore not rendered unpatentable by the Examiner cited references, either taken alone or if combined. Claims 2 - 16 are each dependent on claim 1 and

are therefore likewise patentable. Applicants therefore respectfully request that the rejections of claims 1 – 16 under 35 U.S.C. § 103(a) be withdrawn.

**Conclusion**

Applicants submit that this application is now in condition for allowance, and favorable reconsideration of this application in view of the above amendments and remarks is respectfully requested. Allowance of claims 1 - 16 at an early date is earnestly solicited. If, there are additional fees due, Applicant requests that this paper constitutes any necessary petition and authorizes the Commissioner to charge any underpayment, or credit any overpayment, to Deposit Account No. 23-1925.

If the examiner finds that there are any outstanding issues which may be resolved by a telephone interview, the Examiner is invited to contact the undersigned attorney at the below listed number

Respectfully submitted,
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